CHAPTER 5

DATA COLLECTION

Chapter 5 Data Collection
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5.1 Overview

5.1.1 Introduction

A well-planned data collection program leads to a more orderly and effective analysis and design process. It is appropriate and efficient to identify the types of data that will be required prior to beginning the engineering analysis. The effort necessary for data collection and compilation shall be tailored to the importance of the project. **Not all of the data discussed in this chapter will be needed for every project.**

Data collection for a specific project must be tailored to:

- scope of the engineering analysis,
- project cost,
- complexity of site conditions and hydraulics,
- social, economic environmental and archaeological requirements,
- regulatory requirements, and
- unique project requirements

5.1.2 Data Requirements

In this chapter is an outline of the data types that are normally required for drainage analysis and design, possible sources and other aspects of data collection. The following subjects are presented in this chapter:

- Types and Sources of Data
- Topographic Survey Information
- Field Reviews
- Data Evaluation

Uniform or standardized survey requirements for all projects may prove uneconomical or data deficient for a specific project. Special instructions outlining data requirements may have to be provided to the survey party by the designer for unique sites.

5.1.3 Survey Methods/Computation Accuracy

The publication "Accuracy of Computed Water Surface Profiles," U.S. Army Corps of Engineers, Dec. 1986, focuses on determining relationships between:

- survey technology and accuracy employed for determining stream cross sectional geometry,
- degree of confidence in selecting Manning's roughness coefficients, and
- the resulting accuracy of hydraulic computations.

The publication also presents methods for determining the upstream and downstream limits of data collection for a hydraulic study requiring a specified degree of accuracy.

5.1 Overview (continued)

5.1.3 Survey Methods/Computation Accuracy (continued)

Computer software has been developed to perform the calculations for the various routines presented in this manual. HY-11, Survey Accuracy, is available from the McTrans Center, University of Florida, Gainesville, FL

5.2 Types Of Data Needed

5.2.1 General

The designer must compile the data that are specific to the subject site. Following are the major types of data that may be required:

- existing and proposed land use data in the subject drainage area and in the general vicinity of the facility;
- anticipated changes in land use and/or watershed characteristics;
- floodplain, environmental regulations, and archaeological data;
- watershed characteristics;
- stream reach data (especially in the vicinity of the facility);
- hydrologic and meteorologic data (stream flow and rainfall data related to maximum or historical peak as well as low-flow discharges and hydrographs applicable to the site);
- permit requirements, and;
- other physical data in the general vicinity of the facility such as utilities, easements, etc.

Watershed, stream reach and site characteristic data, as well as data on other physical characteristics can be obtained from a field reconnaissance of the site. Examination of available maps and aerial photographs of the watershed is also an excellent means of defining physical characteristics of the watershed.

Following is a brief description of the major data topics that relate to drainage facility analysis and design. Additional discussion is contained in the AASHTO Highway Drainage Guidelines, Volume II.

5.2 Types Of Data Needed (continued)

5.2.2 Drainage Surveys

The designer should inspect the site and its contributing watershed to determine the required field and/or aerial drainage survey to be undertaken as part of the hydraulic analysis and design. Survey requirements for small drainage facilities such as small culverts are less extensive than those for major facilities such as bridges. However, the purpose of each survey is to provide an accurate picture of the conditions within the zone of hydraulic influence of the facility.

Appendix A contains instructions for typical minor and major drainage surveys.

Following are the data that can be obtained or verified:
- contributing drainage area characteristics;
- stream reach data - cross sections and thalweg profile;
- existing structures;
- location and survey for development, existing structures, etc., that may affect the determination of allowable flood levels, capacity of proposed drainage facilities, or acceptable outlet velocities;
- drift/debris characteristics;
- general ecological information about the drainage area and adjacent lands; and
- high water elevations including the date of occurrence.

Much of these data must be obtained from an on-site inspection. It is often much easier to interpret published sources of data after an on-site inspection. Only after a thorough study of the area and a complete collection of all required information should the designer proceed with the final design of the hydraulic facility. All pertinent data and facts gathered through the survey shall be documented as explained in Chapter 4, Documentation.

5.2.3 Watershed Characteristics

Contributing Size - The size of the contributing drainage area expressed in acres or square miles, is determined from some or all of the following:

- Direct field surveys with conventional surveying instruments.
- Use of USGS or project topographic maps, aerial photographs, digital elevation models, together with field checks to determine any changes in the contributing drainage area such as:
  - terraces,
  - lakes, sinks,
  - debris or mud flow barriers,
  - reclamation/flood control structures,
  - irrigation diversions, and
  - storm drainage systems.

5.2 Types Of Data Needed (continued)

5.2.3 Watershed Characteristics (continued)

In determining the size of the contributing drainage area, any subterranean flow or any areas outside the physical boundaries of the drainage area that have runoff diverted into the drainage area being analyzed shall be included in the total contributing drainage area. In addition, it must be determined if floodwaters are diverted out of the basin before reaching the site.

Slopes - The slope of the stream and the average slope of the watershed (basin slope) should be determined. Hydrologic and hydraulic procedures in other chapters of this manual are dependent on watershed slopes as well as other factors.

Watershed Land Use

- Define and document the present and expected future land use, particularly the location, degree of anticipated urbanization and data source.
- Information on existing use and future urbanization trends may be obtained from:
  - field review
  - aerial photographs (conventional and infrared),
  - zoning maps and master plans,
  - USGS and other maps,
  - municipal planning agencies, and
  - landsat (satellite) images.

Specific information about particular tracts of land can often be obtained from owners, developers, realtors and local residents. Care should be exercised in using data from these sources since their reliability may be questionable and these sources may not be aware of future development within the watershed that might affect specific land uses.

Existing land use data for small watersheds can best be determined or verified from a field survey. Field surveys shall also be used to update information on maps and aerial photographs, especially in basins that have experienced changes in development since the maps or photos were prepared. Infrared aerial photographs may be particularly useful in identifying types of urbanization at a point in time.

Streams, Rivers, Ponds, Lakes, Wetlands and Detention Basins

At all streams, rivers, ponds, lakes and wetlands that will affect or may be affected by the proposed structure or construction, the following data shall be secured. These data are essential in determining the expected hydrology and may be needed for regulatory permits.

- Outline of the boundary (perimeter) of the water body for the ordinary highwater.
- Elevation of normal as well as high water for various frequencies.
- Detailed description of any natural or manmade spillway or outlet works including dimensions, elevations and operational characteristics.

5.2 Types Of Data Needed (continued)

5.2.3 Watershed Characteristics (continued)

Streams, Rivers, Ponds, Lakes, Wetlands and Detention Basins (continued)

- Detailed description of any emergency spillway works including dimensions and elevations.
- Description of adjustable gates, soil and water control devices.
- Profile along the top of any dam and a typical cross section of the dam.
- Use of the water resource (stock water, fish, recreation, power, irrigation, municipal or industrial water supply, etc.).
- Existing conditions of the stream, river, pond, lake or wetlands as to turbidity and silt.
- Riparian ownership(s) as well as any water rights.

Environmental Considerations

The need for environmental data in the engineering analysis and design stems from the need to investigate and mitigate possible impacts due to specific design configurations. Environmental data needs may be summarized as follows:

- Information necessary to define the environmental sensitivity of the facility's site relative to impacted surface waters, e.g., water use, water quality and standards, aquatic and riparian wildlife biology and wetlands information.
- Information necessary to determine environmentally compatible designs, e.g., circulation patterns and sediment transport data.
- Data needs at wetlands are unique and can be identified through coordination with AZ Game and Fish, U.S. Fish and Wildlife Service, etc.

5.2.4 Site Characteristics

A complete understanding of the physical nature of the natural channel or stream reach is of prime importance to a good hydraulic design — particularly at the site of interest. Any work being performed, proposed or completed, that changes the hydraulic efficiency of a stream reach must be studied to determine its effect on the stream flow. The designer should be aware of plans for channel modifications, and any other changes that might affect the facility design.

The stream may be classified as:

- rural or urban,
- improved or unimproved,
- narrow or wide,
- rapid or sluggish flow,
- stable, transitional, or unstable,
- sinuous, straight, braided, alluvial, or incised, and
- perennial or intermittent flow.

5.2 Types Of Data Needed (continued)

5.2.4 Site Characteristics (continued)

Geomorphological data are important in the analysis of channel stability and scour. Types of needed data are:

- sediment transport and related data,
- stability of form over time (braided, meandering, etc.),
- scour history/evidence of scour, and
- bed and bank material identification

Chapter 7, Channels presents additional information regarding the site characteristics that should be considered in the analysis of channels.

Roughness Coefficients

Roughness coefficients, ordinarily in the form of Manning's n values shall be estimated for the entire flood limits of the stream. A tabulation of Manning's n values with descriptions of their applications can be found in Chapter 7, Channels.

Stream Profile

Stream bed profile data shall be obtained and these data should extend sufficiently upstream and downstream to determine the average slope and to encompass any proposed construction or aberrations. Identification of "headcuts" which could migrate to the site under consideration are particularly important. If the stream has flow, the profile data of the water surface shall also be obtained. If there is a stream gage relatively close, the discharge, date and hour of the reading shall be obtained.

Stream Cross Sections

Stream cross section data shall be obtained that represent the conditions at the structure site. Stream cross section data should also be obtained at other locations where stage-discharge and related calculations will be necessary.

Existing Structures

The location, size, description, condition, observed flood stages and channel section relative to existing structures on the stream reach and near the site shall be secured in order to determine their capacity and effect on the stream flow. Any structures, downstream or upstream, which may cause backwater or retard stream flow shall be investigated. Also, the manner in which existing structures have been functioning with regard to such things as scour, overtopping, debris and ice passage, fish passage, etc. shall be noted. With bridges, these data shall include span lengths, type of piers and substructure orientation which usually can be obtained from existing structure plans. The necessary culvert data includes size, inlet and outlet geometry, slope, end treatment, culvert material and flow line profile. "As built" highway construction plans may be available to obtain required bridge and/or culvert data. Photographs and high water profiles or marks of flood events at the structure and past flood scour data can be valuable in assessing the hydraulic performance of the existing facility.

Controlling Flood Levels

Development and property use adjacent to the proposed site, both upstream and downstream, may determine controlling flood levels. Floor elevations of structures or fixtures shall be noted. In the absence of upstream development, the presence of downstream development may determine appropriate overflow points when an overtopping design of the highway is considered.

5.2 Types Of Data Needed (continued)

5.2.4 Site Characteristics (continued)

Flood History

The history of past floods and their effect on existing structures are of exceptional value in making flood hazard evaluation studies, as well as needed information for sizing structures. Information may be obtained from newspaper accounts, local residents, flood marks or other positive evidence of the height of historical floods. Changes in channel and watershed conditions since the occurrence of the flood shall be evaluated in relating historical floods to present conditions.

Recorded flood data are available from agencies such as:

- U.S. Army Corps of Engineers,
- U.S. Geological Survey,
- U.S. Soil Conservation Service,
- Federal Emergency Management Agency,
- Bureau of Reclamation,
- Local Flood Control Districts, and
- AZ Department of Water Resources.

Anecdotal information may be available from ADOT maintenance personnel or local or State public safety personnel.

Scour Potential

Scour potential is an important consideration relative to the stability of the structure over time. Scour potential will be determined by a combination of the stability of the natural materials at the facility site, tractive shear force exerted by the stream and sediment transport characteristics of the stream. Data on natural materials can be obtained by tests of the site materials.

Bed and bank material samples sufficient for classifying channel type, stability and gradations, as well as a geotech study to determine the substrata if scour studies are needed, will be required. The various alluvial river computer model data needs will help clarify what data are needed. Also, these data are needed to determine the presence of bed forms so a reliable Manning's roughness coefficient as well as bed form scour can be estimated.

Controls Affecting Design Criteria

Many controls will affect the criteria applied to the final design of drainage structures including allowable headwater level, allowable flood level, allowable velocities, and resulting scour and other site specific considerations. Data and information related to such controls can be obtained from Federal, State and local regulatory agencies and site investigations to determine what natural or man-made controls shall be considered in the design.

5.2 Types Of Data Needed (continued)

5.2.4 Site Characteristics (continued)

Controls Affecting Design Criteria (continued)

The redirection of floodwaters can significantly affect the hydraulic performance of a site. Some actions that redirect flows are irrigation facilities, debris jams, mud flows and highways or railroads. In addition, there may be downstream and upstream controls which shall be documented.

Downstream Control - Any ponds or reservoirs, along with their spillway elevations and design levels of operation, shall be noted as their effect on backwater and/or streambed aggradation may directly influence the proposed structure. Also, any downstream confluence of two or more streams shall be studied to determine the effects of backwater or streambed change resulting from that confluence. Gravel mining operations shall be noted.

Upstream Control - Upstream control of runoff in the watershed shall be noted. Conservation and/or flood control reservoirs in the watershed may effectively reduce peak discharges at the site and may also retain some of the watershed runoff. Capacities and operation designs for these features shall be obtained. The reservoir sponsors often have complete reports concerning the operation and design of proposed or existing conservation and/or flood control reservoirs. Gravel mining operations shall be noted.

5.3 Sources of Data

5.3.1 Sources

Much of the data and information necessary for the design of highway drainage facilities may be obtained from some combination of the sources listed below:

The major and most common data sources are

Meteorological Data:	National Weather Service
Watershed Characteristics;	
Size, slope, watercourses:	USGS maps
Soil:	National Resource Council, Soil Conservation Service Soil Maps and Studies
Floodplain Studies:	Arizona Department of Water Resources Local Flood Control Districts
Environmental Data:	Arizona Game and Fish Department US Forest Service US Fish and Wildlife US Bureau of Land Management

5.3 Sources of Data (continued)

5.3.2 Geographic Information Systems (GIS)

Geographic information systems (GIS) may be used as a source of georeferenced hydrologic data required in hydraulic design decision making. For example, Maricopa County has developed a GIS database containing the land cover, soil type and topography. This database may then be used to produce the existing and ultimate development hydrographs as well as an array of maps, graphs and tables needed to complete the hydrologic analysis.

5.3.3 National Flood Insurance Program

Many streams have been analyzed for local flood insurance studies. In these cases, data collection is normally unnecessary since the discharges and hydraulic models are normally available from the Federal Emergency Management Agency. Even though these studies are a good source of data, their technical content should be reviewed prior to using the data. Many of the studies are outdated and/or will not reflect changes that may have occurred in the study reach since its initial publication.

5.4 Survey Information

5.4.1 General

Complete and accurate survey information is necessary to develop a design that will best serve the requirements of a site. The amount of survey data gathered shall be commensurate with the importance and cost of the proposed structure and the expected flood hazard. Data collection shall be as complete as possible during the initial survey in order to avoid repeat visits. Thus, data needs must be identified and tailored to satisfy the requirements of the specific location and size of the project early in the project design phase.

At many sites photogrammetry is an excellent method of securing the topographical components of drainage surveys. Planimetric and topographic data covering a wide area are easily and cost effectively obtained in many geographic areas. A supplemental field survey is required to provide data in areas obscured on the aerial photos (underwater, heavy vegetation, etc.).

5.4.2 ADOT Requirements

Instructions for hydraulic surveys are contained in the ADOT survey manual. An outline of these requirements is presented in Appendix A of this chapter. Example of forms and check lists are provided in Appendix B.

5.5 Field Reviews

5.5.1 On Site Inspection

The designer shall make field reviews in order to become familiar with the site. The most complete survey data cannot adequately depict all site conditions or substitute for personal inspection by someone experienced in drainage design. Factors that most often need to be confirmed by field inspection are:

- selection of roughness coefficients,
- evaluation of apparent flow direction and diversions,
- flow concentration,
- observation of land use and related flood hazards,
- geomorphic relationships,
- highwater marks or profiles and related frequencies,
- existing structure size and type, and
- existence of wetlands.

The field visit shall be made before final hydraulic design is undertaken. There are several criteria that shall be established before making the field visit. Can any needed information be obtained from maps, aerial photos, or by telephone calls? What kind of equipment should be taken, and most important, what exactly are the critical items at this site? Photographs shall be taken. As a minimum, photos shall be taken looking upstream and downstream from the site as well as along the contemplated highway centerline in both directions. Details of the streambed and banks should also be photographed along with structures in the vicinity both upstream and downstream. Close up photographs complete with a scale or grid shall be taken to facilitate estimates of the streambed gradation.

5.5.2 Check List

Sample forms for use in identifying and cataloging field information are shown in Appendix C.

5.6 Data Evaluation

5.6.1 Objective

Once the needed data have been collected, the next step is to compile it into a usable format. The designer must ascertain whether the data contains inconsistencies or other unexplained anomalies which might lead to erroneous calculations or results. The main reason for analyzing the data is to draw all of the various pieces of collected information together and to fit them into a comprehensive and accurate representation of the hydrologic and hydraulic characteristics of a particular site.

5.6.2 Evaluation

Experience, knowledge and judgment are important parts of data evaluation. It is in this phase that reliable data shall be separated from that which is less reliable and historical data combined with that obtained from measurements. The data shall be evaluated for consistency and to identify any changes from established patterns. Reviews shall be made of such things as previous studies, old plans, etc., for types and sources of

5.6 Data Evaluation (continued)

5.6.2 Evaluation (continued)

data, how the data were used and any indications of accuracy and reliability. Historical data shall be reviewed to determine whether significant changes have occurred in the watershed and whether these data can be used. Data should always be subjected to careful study by the designer for accuracy, reliability and compatibility with the intended use.

Basic data, such as streamflow data derived from non-published sources, shall be evaluated and summarized before use. Maps, aerial photographs, Landsat images and land use studies shall be compared with one another and with the results of the field survey and any inconsistencies resolved. General references shall be consulted to help define the hydrologic character of the site or region under study and to aid in the analysis and evaluation of data.

5.6.3 Sensitivity

Often sensitivity studies can be used to evaluate data and the importance of specific data items to the final design. Sensitivity studies consist of conducting a design with a range of values for specific data items. The effect on the final design can then be established. This is useful in determining what specific data items have major effects on the final design and the importance of possible data errors. Time and effort shall then be spent on the more sensitive data items making sure these data are as accurate as possible. This does not mean that inaccurate data are accepted for less sensitive data items, but it allows prioritization of the data collection process given a limited dollar and time allocation.

The results of this type of data evaluation shall be used so that as reliable a description as possible of the site can be made within the allotted time and the resources committed to this effort. The effort of data collection and evaluation shall be commensurate with the importance and extent of the project and/or facility.

5.7 References

FHWA. Hydraulic Design Series HDS-2, Hydrology. 1996.
Geographic Information Systems: An Introduction (Star and Estes, 1990),
Geographic Information Systems: A Management Perspective (Aronoff, 1990),
Geographic Information Systems — A Guide to the Technology (Antenucci, et. al., 1992)

Appendix A - Field Visit Documentation Forms

Form 1
FIELD VISIT DOCUMENTATION FORM

DATE:_____
PROJECT:_____
BY:_____

STRUCTURE TYPE

SIZE OR SPAN
 # OF BARRELS OR SPANS

CLEAR HT

ABUT TYPES

INLET TYPE
EXISTING WTWY COVER
OVERFLOW BEGINS @ EL.

MAX AHW
REASON:

UP OR DOWNSTREAM RESTRICTION:

OUTLET CHANNEL, BASE
MANNING'S n VALUE:
TYPE OF MATERIAL IN STREAM

PONDING

CHECK BRIDGES UPSTREAM AND DOWNSTREAM

CHECK LAND USE UPSTREAM AND DOWNSTREAM

SURVEY REQUIRED? YES___ NO

REMARKS:

PIERS: TYPE

SKEW
INLET
OUTLET
% GRADE OF ROAD
% GRADE OF STREAM
LENGTH OF OVERFLOW
CHECK FOR DEBRIS

SIDE SLOPES
HEIGHT OF BANKS

Appendix A - Field Visit Documentation Forms

Form 2
HYDRAULIC FIELD VISIT DOCUMENTATION LIST

I. GENERAL PROJECT DATA

1. Project Number:_____ 2. County:
3. Road Name:
4. Site Name:_____, Station _____ M.P.
5. Site Description: ( ) Cross drain, ( ) Irrigation, ( ) Storm Drain, ( ) Long. Encroach, ( ) Ch. Change, ( ) Other
6. Survey Source: ( ) Field, ( ) Aerial, ( ) Other
7. Date Survey Received:_____, from_____(name)
8. Site Inspected by_____ on _____
(name) (date)

II. OFFICE PREPARATION FOR INSPECTION

1. Reviewed:
Aerial Photos - ( ) Yes, Photo #'s _____, ( ) None Available
Mapping/Maps - ( ) Yes, Map #'s _____, ( ) None Available
Reports - ( ) Yes, ( ) No, ( ) None Available at this time
Permanent File - ( ) Yes, ( ) No, ( ) No file data found

2. Special Requirements and Problems Identified for Field Checking:

( ) Hydrologic Boundary - obtain hydrologic channel geometry
( ) Adverse Flood History - obtain HW Marks/dates/eye witness
( ) Irrigation Ditch - obtain several Water Right depths
( ) Permits Req'd - ( ) COE, ( ) Dam, ( ) Coast Guard, ( ) FEMA
( ) Other
( ) Adverse Channel Stability and Alignment History - Check for headcutting, bank caving, braiding, increased meander activity
( ) Structure Scour - check flow alignment, scour at culvert outlet or evidence of bridge scour
( ) Obtain bed/bank material samples at

III. FIELD INSPECTION
(The following details obtained at the site are annotated on the Drainage Survey)
1. Survey appears correct: - ( ) Yes, ( ) Apparent errors are:
_____ which were resolved by:_____

2. Flooding Apparent? - ( ) No, ( ) Yes, HW marks obtained, ( ) Yes but HW marks not obtained because
_____

Appendix A - Field Visit Documentation Forms

Form 2 (Continued)
HYDRAULIC FIELD VISIT DOCUMENTATION LIST (continued)

3. Do all Floods Reach Site? - ( ) Yes, ( ) No and details obtained, ( ) No but details not obtained because _____

4. Do Floodwaters Enter Irrigation Ditch ? - ( ) N/A, ( ) No, ( ) Yes and details obtained, ( ) Yes but details not obtained because_____ _____

5. Hydrologic Channel Geometry obtained? - ( ) Yes, ( ) No because _____ _____

6. Channel Unstable? - ( ) No , ( ) Yes because of ( ) headcutting observed and ( ) amount/location obtained, ( ) bank caving, ( ) braiding, ( ) increased meander activity, ( ) Other _____ _____

7. Structure Scour in Evidence? - ( ) No, ( ) Minor, ( ) Yes and ( ) obtained bed/bank samples and ( ) noted any flow alignment problems, ( )Yes and ( ) bed/bank material samples not obtained and ( ) flow alignment not noted because _____

8. Irrigation facility? - ( ) No, ( ) Yes and several water right related depths obtained, ( ) Yes and No water right related depths obtained because_____ _____

9. Manning's n obtained? - ( ) Yes, ( ) No because_____ _____

10. Property damage due to backwater? - ( ) No ( ) Yes and elevation/property type checked, ( ) Yes but elevation/property type not obtained because_____ _____

11. Environmental Hazards Present? - ( ) No, ( ) Yes, details obtained, ( ) Yes, details not obtained because _____

12. Ground Photos Taken? - ( ) Upstream floodplain and all property, ( ) Downstream floodplain and all property, ( ) Site looking from downstream, ( ) Site looking from upstream, ( ) Evidence of channel instability, ( ) Evidence of scour, ( ) Channel Material w/scale, ( ) Existing structure inlet/outlet, ( ) Other

13. Effective drainage area visually verified? ( ) Yes, ( ) No because_____ _____

Appendix B - Sources Of Data

Principal Hydrologic Data Sources

•Meteorological Data

National Oceanic and Atmospheric Agency (NOAA)
National Climatic Data Center
37 Battery Park Avenue
Federal Building
Asheville, North Carolina 28801
(704) 271-4800 FAX (704) 271-4876

- Regional and local flood studies
- U.S. Geological Survey regional and any site studies
- Surveyed high water marks and site visits
- Hydrology data from others:

Local Flood Control Districts

Principal Watershed Data Sources

- U.S. Geological Survey maps ("Quad" sheets)

U.S. Geological Survey
Rocky Mountain Mapping Center
Mail Stop 504
Denver Federal Center
Denver, Colorado 80225
(303) 236-5829

- EROS aerial photographs

U.S. Geological Survey
EROS Data Center
Sioux Falls, South Dakota 57198
(605) 594-6151

- U.S. Geological Survey
- State and local maps and aerial photos
- State geological maps
- Soil Conservation Service and BLM Soils Maps
- County Soils Maps

Principal Site Data Sources

- ADOT files for existing facilities
- Field or aerial surveys from others

Appendix B - Sources Of Data (continued)

Principal Regulatory Data Sources

• Federal floodplain delineations and studies

Federal Emergency Management Agency
Flood Map Distribution Center
6930 (A-F) San Tomas Road
Baltimore, Maryland 21227-6227
(800) 358-9616

• State floodplain delineations and studies from Local Flood Control Districts and AZ Dept. of Water Resources.

Principal Environmental Data Sources

• U.S. Environmental Protection Agency data and studies
• U.S. Corps of Engineers data and studies
• U.S. Geological Survey water quality data
• Arizona Department of Water Resources water quality data
• Environmental statements prepared by other Federal, State and local agencies as well as private parties

Principal Demographic, Economic and Political Data Sources

• Agency files for existing facilities,
• Agency plans for proposed facilities,
• Agency field or aerial surveys,
• Agency planning, budgeting and scope documents,
• Agency reports, memorandums, minutes and verbal communications.

Other Data Sources

For Federal agencies, the designer should begin contact with the local office.
• U.S. Bureau of Reclamation (USBR)
• Central Arizona Project (CAP)
• U.S. Bureau of Land Management (BLM)
• U.S. Environmental Protection Agency (EPA)
• U.S. Federal Emergency Management Agency (FEMA)
• U.S. Fish and Wildlife Service (USFWS)
• U.S. Forest Service (USFS)
• U.S. Soil Conservation Service (SCS)
• U.S. Corps of Engineers (COE)
• U.S. Geological Survey (USGS)
• Federal Highway Administration (FHWA)
• National Weather Service (NWS)

Appendix B - Sources Of Data (continued)

Other Data Sources (continued)

- National Oceanic and Atmospheric Administration (NOAA)
- Indian Natural Resource Agencies
- Salt River Project (SRP)
- Arizona Department of Environmental Quality (ADEQ)
- Arizona Department of Water Resources (ADWR)
- Arizona State Land Department (ASLD)
- Local irrigation, drainage, flood control and watershed districts
- Municipal governments
- Private citizens
- Private industry